DOCUMENT RESUME

ED 335 773 EA 023 250

AUTHOR Cooley, William W.
TITLE Testing and School Improvement. PEPS Policy Paper Series Number 9.
INSTITUTION Pittsburgh Univ., Pa. Learning Research and Development Center.
PUB DATE 3 Jun 91
NOTE 21p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Basic Skills; Competence; Elementary Education; *Minimum Competency Testing; Public Schools; *Scores; Socioeconomic Influences; *Socioeconomic Status; Student Promotion
IDENTIFIERS *Pennsylvania; Test of Essential Learning and Literacy Skills

ABSTRACT

The Test of Essential Learning and Literacy Skills (TELLS) has been administered to all Pennsylvania students in grades 3, 5, and 8 since 1985. An analysis of results from the 1,505 public elementary schools that served both third and fifth graders between 1986 and 1990 show that in 150 of these schools more than 50 percent of the students scored below the minimum skill level. The figures also indicated that no matter for what grades or years scores are analyzed, schools tend to be consistent in their performance ranking. The achievement differences among schools are almost completely predictable from the socioeconomic status (SES) indicators of the families being served by them. Simple solutions for raising the basic skill level of students from homes with low SES, such as raising teacher salaries or reducing pupil/teacher ratios, do not look promising. Higher salaries can increase applicant pool quality but will not necessarily raise teaching staff quality. Smaller classes can be helpful if instruction is designed to take advantage of it. Proposals for improvement include investing in preschool experiences that increase school readiness skills. Four tables illustrate the data analysis. (8 references) (EJS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED335773

Pennsylvania Educational Policy Studies

PEPS is a joint effort of the U. of Pittsburgh's School of Education and the Learning Research and Development Center
This is policy paper number 9 in this series

Testing and School Improvement

by

William W. Cooley

University of Pittsburgh

June 3, 1991

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
J. Aug
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

The purpose of this series of papers is to contribute to a more informed debate about critical policy issues facing Pennsylvania's public schools. This PEPS series draws upon a data base that has been established here at the University of Pittsburgh under the direction of William Cooley in cooperation with the Pennsylvania Department of Education.

Reactions can be shared:

by mail: LRDC, Pgh.,PA 15260
by phone: 412-624-7085
by PittVAX: COOLEY
by BITNET:COOLEY@PITTVMS
by FAX: 412-624-7088
by chat: room 743, LRDC
by PENN*LINK: PEPS

EA 023 250

BEST COPY AVAILABLE

Executive Summary

This paper examines five years of state test results (TELLS), focusing upon differences among Pennsylvania's elementary schools, particularly those schools with a majority of their students not mastering essential learning skills.

The largest learning problems occur in about 10% of the schools, and those schools have been consistently low for the past five years. Making public the test results of low scoring schools has not solved the problem.

The achievement differences among schools is almost completely predictable from the socio-economic differences of the families being served by these schools. This is not news, but the persistent, dominant importance of home factors must be confronted if the situation is to improve.

Simple but costly solutions, such as raising teacher salaries or reducing pupil/teacher ratios, do not look promising if that is all that is done. In fact, the lower scoring schools currently tend to have slightly better paid teachers and slightly smaller pupil teacher ratios.

Increasing teacher salaries could be helpful in increasing the quality of the thousands of new teachers to be hired in the '90's if valid teacher quality indicators were available and used by districts in that hiring. Higher salaries can increase the quality of the applicant pool, but that will not necessarily increase the quality of the teaching staff if teachers are hired for reasons other than their ability to teach.

Smaller classes can be helpful if instruction is designed to take advantage of it, and if use of smaller classes was managed, and didn't just happen. Currently pupil/teacher ratios are largely unrelated to student needs or to student achievement growth. If it is business as usual, the possible positive achievement effect of smaller classes will continue to be elusive.

These results illustrate why it has been so difficult for research to establish the student achievement benefits of higher per pupil spending, since most spending variation among our 500 school districts is due to differences in teacher salaries or pupil/teacher ratios.

Testing and School Improvement

William W. Cooley

As the debates rage about how to reform, restructure and retest the nation's schools, it seems useful to examine what can be said about these issues based upon actual data from one state's testing program. This paper examines the results of testing in Pennsylvania's elementary schools between 1986 and 1990, and seeks implications for some of the current debates. The results are derived from the state database established as part of the Pennsylvania Educational Policy Studies.

The student performance information is based upon a Test of Essential Learning and Literacy Skills (TELLS), which has been administered to all students in grades 3, 5 and 8 since 1985. The indicator of school performance used here is the percent of the students in the school that score below the minimum cut-score established by the state. Included in these analyses are the 1,505 public elementary schools that served both 3rd and 5th graders between 1986 and 1990.

Figure 1 illustrates how that school performance indicator distributes for grade 5 reading in 1989, for example. As seen there, most of the schools had fewer than 30% of their students score below the cut score, but about 150 schools had more than 50% of their students score below the minimum (the schools in the right hand

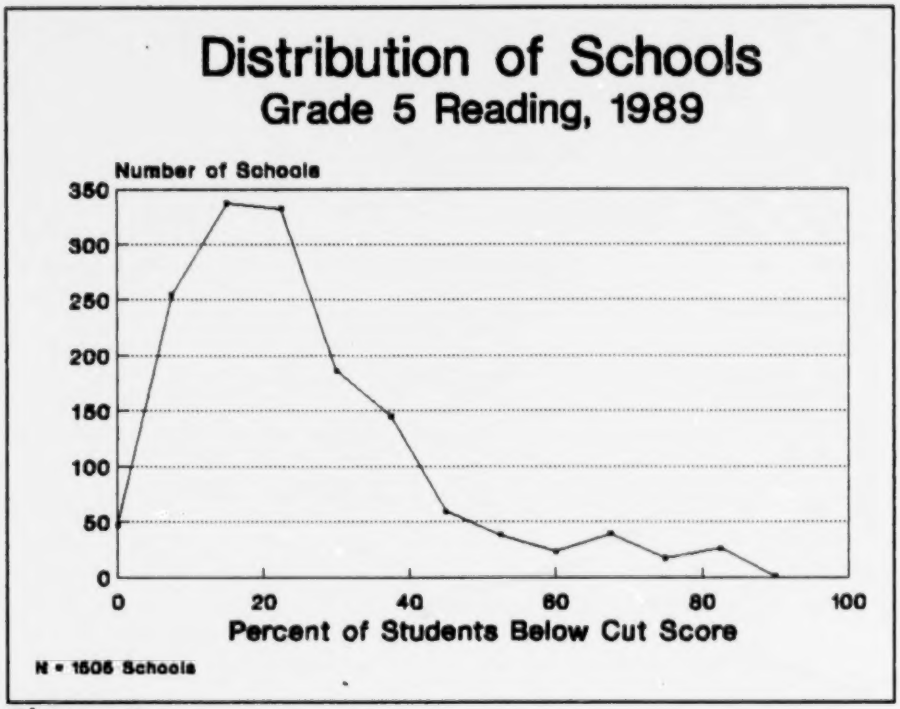

Figure 1

"tail" of the distribution). Similar results were found for math and for all five years of TELLS testing. This paper explores why some schools seem to do so poorly, why it is serious, and what might be done to improve things.

It must be emphasized at the outset that this paper is looking at schools, not individual students. Thus the relationships reported here are among schools, not students. For example, schools with a large percentage of students from homes on welfare tend to have large numbers of students performing low on the TELLS test. That school level relationship is significantly stronger than is the student level relationship between home

status and how individual students perform on the TELLS test. That is, it is much easier to predict the TELLS performance for a school than for a student, given home backgrounds. This point is important when considering what can be said about the effectiveness of a school, given school achievement results.

It is also important to justify the school performance measure used here, which is the percent of students in the school who scored below the minimum cut score. The TELLS questions were the essential learning and literacy skills in reading and mathematics which committees of educators agreed all students should have mastered by that grade level. A student was below the cut score if more than about one-third of the questions were answered incorrectly. Even if one believes that the cut scores are arbitrary, that does not invalidate the kind of correlational analyses reported here. Changes in the cut score does not change the relative rankings of the schools. In fact, the relationships among schools based upon these established cut scores are identical to those that are obtained using school means as the school performance measure.

Students have great difficulty learning from subsequent schooling if these basic skills are not mastered. For example, fourth grade instruction assumes the students possess the grade 3 TELLS skills. High

schools assume these skills have been mastered. Employers require them. Having an entire school at risk because most of the students in that school do not know these skills is not acceptable.

Other papers in this PEPS series have shown why the TELLS test should be replaced by a more appropriate state test for purposes of accountability, curriculum reform, and informing state policy (Cooley & Bernauer, 1990 and Cooley, 1990). For example, TELLS measures too narrow a spectrum of curriculum goals to be the basis for determining what is to be taught. But the available TELLS results do allow us to examine several important current issues, and it seems reasonable to figure out what can be learned from the available test results before moving on to some new enthusiasm. People often call for a new test because we didn't learn much from the last test, but the implications of test results are never self evident, and we will continue to learn little or nothing from them if little or no analyses are conducted. TELLS does measure one aspect of what schooling is about, so let's see what we can learn.

Stability of School Level Results

The degree to which a school would be similarly ranked from one testing to another can best be described using correlations, where a correlation of 1.00 indicates identical rank orderings. Table 1 shows that school

Table 1
Correlation Between Reading and Math

Year	Grade 3	Grade 5
1986	.87	.86
1987	.88	.86
1988	.90	.88
1989	.88	.88
1990	.92	.87

Average = .88

N = 1505 Schools

rankings on student performance in reading and math are very similar for grades 3 and 5, and for all five years. That is, no matter what grade or year one examines, schools tend to have the same rank order whether one ranks reading or ranks math results. The average correlation in Table 1 is .88, with a range of .86 to .92, a very stable set of relationships.

Table 2 reveals another remarkable stability in school performance. The correlations reported there show the stability of school performance between 3rd and 5th grade. For example, third graders in spring 1986 represent the same cohort of students that were in grade 5 in 1988, and reading performance at grade 3 correlates .82 with reading performance at grade 5. Therefore most

of the variation in school differences at grade 5 is predictable from their differences at grade 3. Notice that reading is more stable than math, but that both are very stable for the three cohorts available.

Table 2
Correlations for Same Cohort

Year of Grade 3	Grade 5	Read	Math
1986	1988	.82	.72
1987	1989	.85	.75
1988	1990	.81	.68

School Performance and the Home

Another indicator that is available for each school is the percent of the students that are from low income homes, particularly from families on welfare. Table 3 reports the high correlation that exits between the percent of students below the TELLS cut-score and the percent of the students from low income families, for both grades for the five years. The average correlation for reading is .73, and for math it is .63. The square of the reading correlation indicates that 53% of the variation in reading performance among these 1,505 schools is associated with this home socio-economic status (SES) indicator, and 40% for math. That is, reading performance is more dependent upon home factors than is math.

Table 3
% Below Cut and % Low Income

Year	Grade	Read	Math
1986	3	.69	.60
	5	.73	.62
1987	3	.71	.61
	5	.74	.60
1988	3	.70	.62
	5	.73	.61
1989	3	.75	.65
	5	.74	.63
1990	3	.74	.70
	5	.76	.66
Average Correlation		.73	.63

N = 1505 Schools

There are a few factors that affect the strength of the Table 3 relationships that should be mentioned. One such factor is the degree of overlap between the specific items in the TELLS test and the specifics of what was taught in each of these schools. As this overlap decreases, success on the test depends more and more on what is learned outside of school. Since there is no standard state curriculum, the resulting variation in overlap makes test performance more dependent upon home factors. This helps to explain why reading skills are more dependent upon home differences than are math

skills, since the latter are less likely to be learned outside of school.

Also, the difficulty of a test affects its relationship with home factors. As more difficult items have been added to the TELLS test over time, there is better discrimination among schools with more able students, with correlations increasing slightly over time, as seen in Table 3.

A third factor that affects the home-achievement relationship is the degree to which schools are homogeneous with respect to home SES. The more schools differ in their average demographic makeup, the higher will be the relationship between SES and school achievement. If, for example, schools were completely integrated with respect to SES, the strong relationships of Table 3 would not be found.

The very slight differences in these correlations within each column of Table 3 does reveal a high degree of consistency from year to year. It certainly shows that these indicators are not full of random error from grade to grade or year to year. But it also seems important to try to understand the implications of these trends for state testing programs and for school reform.

One issue is whether the home influence persists as students move up the grades, or whether home SES simply affects the school readiness skills and other

predispositions with which students begin school. This question was examined using a technique called structural modeling, which allows one to examine whether the SES factor is relevant to 5th grade achievement, given their third grade performance. This analysis was possible because the PEPS data base included longitudinal data that were based upon the same students who were 3rd graders in 1987 and fifth graders in 1989.

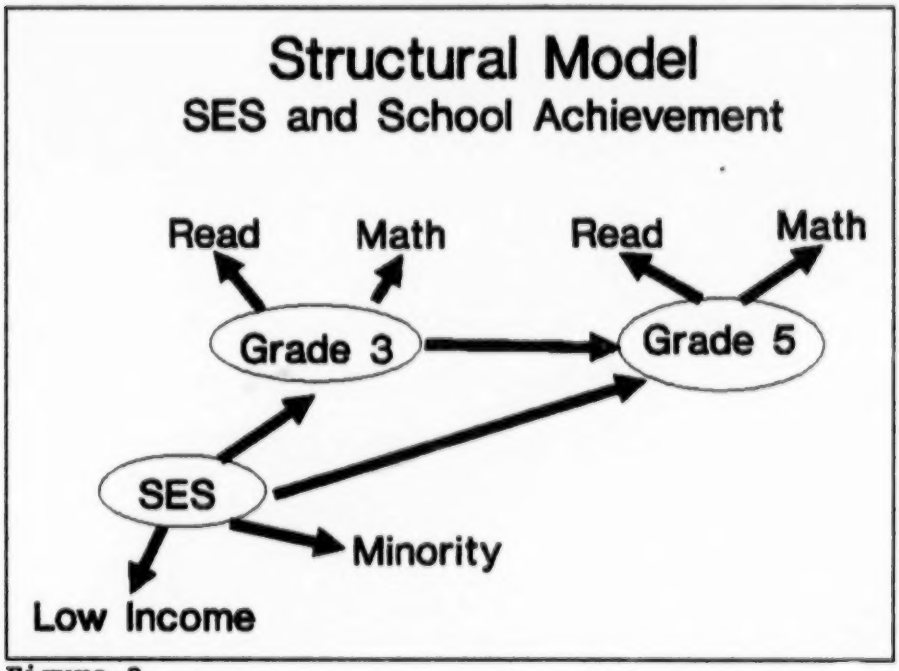

Figure 2

Figure 2 illustrates a simple structural model. As indicated there, the SES factor is measured by the percent minority and the percent low income in the school. Grade 3 is a school-achievement-deficits factor indicating the degree to which students are scoring below

minimum on both reading and math. The Grade 5 factor indicates the degree to which this was true for these same students in fifth grade. The SES factor correlates .91 with Grade 3 and .94 with Grade 5. Grade 3 correlates .86 with Grade 5. The main finding is that the SES factor continues to have a very strong direct effect between grade 3 and grade 5 school achievement. This means that whatever those processes are that result in strong relationships between SES and school performance, they continue as students move up the grades. Put another way, school differences in 5th grade achievement are even more dependent upon home differences than they were at 3rd grade. [The technical details of the structural modeling of these school level data will be provided in a forthcoming PEPS report.]

Another sobering aspect of the Figure 2 analysis is the fact that this simple model explains 90% of the variation in 5th grade school achievement differences. That means that only 10% is left for all the different ways in which schools might be different: large or small, an effective or ineffective principal, curriculum similar to or different from the test, or the hundreds of other innovations, model schools, etc. that are out there.

This does not mean that the situation is hopeless for schools serving low SES students, but it makes it very clear that the problem is not going to solved by

giving more tests. The 150 schools that were "in deep trouble" in 1986 are pretty much the same schools that are scoring low on the test today. Five years of public accountability (e.g., publishing school results in the local newspapers) has not made a difference. It makes it clear that reducing the large number of students not mastering basic skills in some schools is going to be very difficult.

It is possible in this type of analysis to give homes undo credit or blame. Better teachers may be more likely, or good school practices more likely, in schools serving students from higher SES homes. If school practices or resources are correlated with home SES, then the Figure 2 analysis would be unfairly attributing to homes some of the credit or blame that was due the schools.

Another PEPS report (Cooley, 1990) established that the major ways in which high-expenditure-per-pupil districts differed from low spenders is that they paid teachers more and hired more teachers relative to their student enrollment. So let's next examine how these schools differed in pupil/teacher ratio (P/T) and average teacher salary. Table 4 summarizes these correlations.

For example, looking down the first column of Table 4, Read3 is the percent of students below cut on the grade 3 TELLS reading test for 1987. That variable

correlates .85 with 1989 grade 5 reading, as was shown in Table 2, and correlates .69 with percent low income, as in Table 3. The percent minority correlates .72 with Read3, about the same as percent low income. The .13 with teacher salaries indicates a very slight tendency for higher average teacher salaries to be associated with more third graders below the cut score, while the -.21 with P/T (pupils per teacher) indicates that schools with more poor readers have slightly fewer pupils per teacher. Let's look at those last two relationships more carefully.

Table 4
Correlations Among Schools

	Read3	Read5	LowInc	Minrty	TchSal	P/T
Read3	1.00	.85	.69	.72	.13	-.21
Read5	.85	1.00	.74	.74	.15	-.19
LowInc	.69	.74	1.00	.68	.00	-.16
Minrty	.72	.74	.68	1.00	.30	-.21
TchSal	.13	.15	.00	.30	1.00	-.16
P/T	-.21	-.19	-.16	-.21	-.16	1.00

N = 1606 Elementary Schools

The average elementary school in Pennsylvania has 20 pupils for each teacher in the school. But the variation

in P/T is large. Five percent of the schools have a P/T less than 15, and in the top five percent, the P/T is greater than 26. But this variable exhibits very low correlations with other characteristics of the schools (except, of course, costs per pupil). The slight tendencies that do exist (the P/T column in Table 4) indicate that lower P/T are slightly associated with schools that serve more low income homes, in part because the low SES schools have extra teachers supported by compensatory education funds. So if smaller P/T implies a more effective school, that does not explain away the strong home effect of Figure 2. In fact it tends to work against it. Students from higher SES homes tended to attend schools with slightly more pupils per teacher, as seen in Table 4. These results do not refute the possibility that some kinds of instruction with some kinds of students would be facilitated by smaller classes, but the results do indicate that low SES schools are not handicapped because their classes tend to be larger than in high SES schools. That is clearly not the case.

Turning to teacher salaries, the range in average salaries for the elementary schools in 1989 was from $18,900 to $47,000, with the average school paying an average salary of $30,000. So there is about a $28,000 difference between the lowest paying school and the

highest. But this average teacher salary correlates zero (that's 0.00!) with percent low income students. So the big effect we find for the home is not because schools serving high SES homes pay their teachers more.

It is possible that higher salaries or lower P/T ratios might at least explain improvement in achievement test performance, even though they are unrelated to SES. So far my many attempts at finding a significant salary or P/T effect have failed. The variation in P/T or average salary among these 1,505 schools does not explain the variation in percent below the cut-score, controlling for other possible factors, including prior performance. Although a previous PEPS study (Cooley, 1990) reported a slight teacher salary effect at the district level, it seems to wash out when examined at the school level.

The dynamic that leads one to expect a connection between teacher salaries and student achievement goes like this: higher salaries attracts a larger, more qualified pool of applicants; if a district pays teachers more, they will also be able to retain their better teachers; better teachers will produce better students. One place where this may be breaking down is in establishing what is a "better" applicant. I was recently talking with a group of district superintendents about how they selected which teacher to hire from a large pool of applicants. The responses had more to do

with their Board's preferences for demographics than anything else. For example, one superintendent reported that out of 150 applicants for one position, he would have to select from among those few teacher applicants who actually lived in that school district. Even if they could hire based upon some quality indicators, they did not seem to have any criteria for distinguishing among teachers in terms of expected teacher effectiveness. Also, teachers who are good at integrating art into the curriculum, for example, may not be good at figuring out how to teach basic skills to low SES students.

Summary and Conclusions

Five years of TELLS results reveals a very stable set of relationships among schools and between school achievement and other factors, particularly factors associated with the homes being served by a school. It is also clear that there are many schools in which a majority of the students are not learning those basic skills that are needed to profit from subsequent schooling, or needed for employability. For example, there are about 150 schools in Pennsylvania in which, year after year, over half of the students score below minimum competence.

The persistent, dominant importance of home factors has been established and re-established for at least the past 25 years. It is not exactly news. The initial

individual differences which children bring to school seem to determine the achievement differences among schools in the early grades, and those differences persist. So what is to be done?

There is no reason to be optimistic about some of the quick fixes often proposed; for example, better tests, higher teacher salaries, or smaller classes. Teacher salary differences and pupil/teacher ratios are the main differences among districts with different spending levels, so if what districts do when they have more money is raise salaries or hire more teachers, then more money alone will probably not raise the basic skills levels of these low SES schools, unless many other things are changed as well, such as the kinds of teacher quality information districts have and use when they hire new teachers.

What has impressed me the most as I have worked with these state-wide data is how interdependent the many variables seem to be. We are truly dealing with a massive system. Attempts at trying to manipulate one aspect of the system externally (e.g. establishing minimum teacher salaries) may not have the intended effect. Systems often react to intrusions in counter-intuitive ways.

There have been several proposals for improving the basic skills of students from low SES homes: (1) find

ways to improve home processes that are relevant to school learning; (2) invest in preschool experiences that increase school readiness skills and predispositions for low SES students; (3) figure out how to make schools more adaptive to the differences which students bring to school. But evaluating those proposals goes beyond the scope of this paper. We have looked at the pre-school effect, and it is clearly a positive influence. James Bernauer will be reporting on this in a forthcoming PEPS report.

What can be said with confidence about systems is that manipulations of single variables may not produce the desired effects. Systems do not change that easily or in easily predicted ways. Some argue that we need to modify the power relationships within the system before we can expect significant improvements. Others want to apply principles from the marketplace to force school improvements or close them down. One thing that seems clear is that we need to learn more from our educational research efforts if we are to effectively guide the many reform efforts being proposed. This modest PEPS effort is working toward that end.

Previous PEPS Reports

1. The Public Schools and Regional Economic Change by William W. Cooley and Maureen W. McClure, September 1989.
[focuses upon southwestern Pennsylvania]

2. Inequalities and Inequities in the Pennsylvania Public Schools by William W. Cooley, November, 1989.
[primarily concerned with the inequities in school finance and the variations in student performance]

3. School Comparisons in State Wide Testing Programs by William W. Cooley and James A. Bernauer, February, 1990.
[explains why school comparisons of student achievement are usually misleading and how to make them more interpretable]

4. Important Variations Among Pennsylvania School Districts by William W. Cooley, September, 1990.
[describes how financial data, teacher data, and student achievement are interrelated]

5. The Development of a Multilevel Model of State Level Student Achievement by Lawrence Bernstein, October, 1990.
[applies a new statistical model for analyzing multilevel state data--district level and student level]

6. Student Assessment in Pennsylvania by William W. Cooley, December, 1990.
[recommends a statewide student assessment system to replace the present TELLS test]

7. Confidentiality of Education Data and Data Access by William W. Cooley, April, 1990. [discusses the privacy issues involved in establishing research data bases]

8. Fiscal Strain in Pennsylvania's School Districts by William W. Cooley, February, 1991.
[analysis of five year trends in district revenues and expenditures]